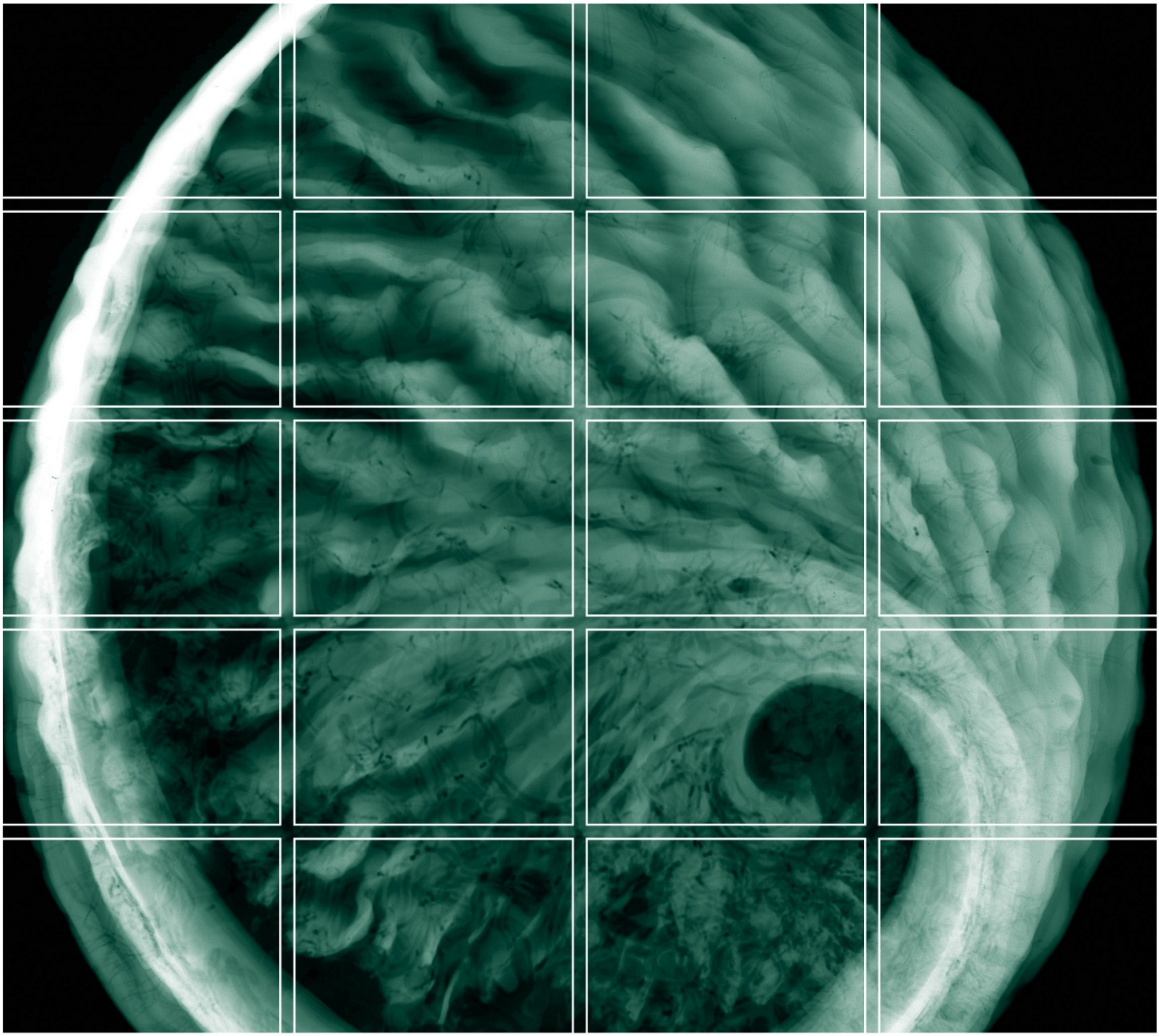

Riverside at Tea Gardens

Construction Environmental Management Plan

Crighton Properties Pty Ltd

January 2013

0043707

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ERM

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Approved by:	*Steve O'Connor*
Position:	Technical Director
Signed:	
Date:	*14 January 2013*

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FINAL REPORT

Crighton Property Pty Ltd

Riverside at Tea Gardens
Construction Environmental Management Plan

January 2013

Environmental Resources Management Australia
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1 INTRODUCTION

1.1 BACKGROUND

Crighton Properties Pty Ltd (Crighton) is seeking concept approval for a residential and tourist development at the Riverside site in Tea Gardens under Part 3A of the *Environmental Planning and Assessment Act, 1979 (*EP&A Act).

This Construction Environmental Management Plan (CEMP) has been prepared by Environmental Resources Management (Australia) Pty Ltd (ERM) for the initial stages of the residential and tourist development and details the proposed environmental management procedures that will be implemented during construction.

1.2 SITE DESCRIPTION

The Riverside at Tea Gardens site ('the site') comprises Lot 10 DP 270100, Lot 40 DP 270100, and Part Lot 1 DP 270100 and is approximately 222.5 hectares in area. The site is bounded by Myall River to the east and Myall Street to the west. The Shearwater Residential Estate lies to the north of the site and residential development of Tea Gardens is to the south. The site has approximately a one kilometre frontage to Myall Street and two kilometre frontage to the Myall River. State Environmental Planning Policy No. 14 – Coastal Wetlands (SEPP 14) applies to wetlands within a portion of the eastern boundary of the site adjacent to the Myall River. These wetlands were clearly identified along with a buffer to the wetlands and zoned for environment protection when the site was rezoned in 2000.

The site is flat with generally sandy soils. The majority of the site was previously used for a pine plantation and has been substantially cleared of native vegetation. Some scattered isolated occurrences of both pines and natives currently exist on the site. A locality plan is provided in *Figure 1.1.*

Legend

Riverside at Tea Gardens Site Boundary

Source:

1:25,000 Topo Series Port Stephens Sheet

Suffix	*Revisions*	*Date*	*Init*
R0	Preliminary Issue	06-12-11	JD

Figure 1.1

Locality Plan

Client:	Crighton Properties Pty Ltd	
Project:	Concept Plan 2011 Environmental Assessment Riverside at Tea Gardens	
Drawing No:	0043707h_CP_EA_11_CEMP_C001_R0.cdr	
Date:	06/12/2011	Drawing size: A4
Drawn by:	JD	Reviewed by: SO'C
Scale:	Refer to Scale Bar	

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0 250 500 750m

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1.3 PROJECT DESCRIPTION

Riverside at Tea Gardens will include a residential development over the majority of the site and a tourist and residential component located within the north eastern portion of the site. *In total the development footprint occupies only 32.6% of the total site. The new Concept Plan seeks consent to develop only 72.5ha of the 222.5ha.* The key elements of the overall concept plan include:

- residential development of the site which will include the potential to create approximately 945 dwellings, comprised as follows:

Development	Number of Dwellings
Residential (variety of lots)	880
Tourist Precinct – lodges	50
Tourist Precinct – houses	15
Total	**945**

- water sensitive urban design (WSUD) measures including the retention of the existing saltwater basin and single drain outlet to the Myall River and new dry water management devices;
- a residentially zoned open space network which provides for public recreation, stormwater management, a wildlife corridor, and clubhouses and community facilities;
- an 10.4 hectare tourist/recreational precinct (including a conference centre and accommodation) in the north east portion of the site and a foreshore park of 1.4 hectares (included as part of the open space network);
- substantial areas of the Residential 2(f) zoned land are proposed to be protected and enhanced as open space / wildlife movement corridors, over and above those already protected within the Environmental Protection 7(a) and 7(b) zones (which comprise 28.6 and 21 hectares respectively);
- large areas of drainage reserves and large parks also proposed;
- upgrading of intersections and associated road works and other construction works (such as cycleways) external to the site;
- access from Toonang Drive and Myall Street;
- an internal road network; and
- associated landscaping and infrastructure works.

Substantial areas of the Residential 2(f) zoned land are proposed to be protected and enhanced as open space / wildlife movement corridors, over and above those already protected within the Environmental Protection 7(a) and 7(b) zones.

The Concept Plan for Riverside at Tea Gardens is provided in *Figure 1.2*.

The area proposed to be developed has been defined by a detailed analysis of the constraints and opportunities of the site to determine the most appropriate development footprint.

The subdivision will be created under Community Title, as part of the existing approved Community Title residential development.

Whilst Concept Approval only is sought at this stage, this Construction Environmental Management Plan (CEMP) has been prepared to identify key environmental management measures that will be implemented during the construction of the subdivision following approval of a future development application. The plan will be updated as required prior to the commencement of construction. The CEMP relates to the construction of the subdivision and associated infrastructure only and does not address construction of dwellings once the construction of the subdivision is complete.

1.4 CONSTRUCTION ACTIVITIES

Activities associated with the construction of the subdivision, and which are covered by this plan include:

- clearing of vegetation in accordance with the project approval;
- stripping and stockpiling of topsoil;
- construction of road pavements, kerb and guttering, and associated piped stormwater drainage and water quality controls;
- construction of telecommunications, electricity, and reticulated water and sewer services and infrastructure;
- earthworks; and
- revegetation of exposed soils following completion.

1.5 OPERATING HOURS

Proposed operating hours are within the following:

- Monday to Friday, 7:00 am to 6:00 pm;
- Saturday, 8:00 am to 4:00 pm if inaudible at residential premises, alternatively hours will be 8:00 to 1:00pm; and
- no construction on Sundays or public holidays.

Item	Description
1	Extent of concept plan area 'Riverside' at Tea Gardens.
2	Existing 7(a) wetland zone.
3	Existing 7(b) buffer zone.
4	Wildlife movement corridor.
5	Water management & open space corridors.
6	Community parks incorporating walking/cycle ways, BBQs, children's play area equipment.
7	Community pocket parks.
8	Not Applicable
9	Not Applicable
10	Existing detention and water quality lake.
11	New fresh water, water quality management & detention ponds.
12	Existing residential development.
13	Foreshore Setback line.
14	Future precinct community facilities.
15	Site area currently owned by Great Lakes Council.
16	Separate medium density/commercial precint (not part of this application-current waver issued by DoP.)
17	Tourist lodgings precinct.
18	Additional land proposed for conservation
19	Proposed residential lot development to be developed under community title.
20	Future development site.
21	Existing house.
22	DCP buffer.
23	Location of known midden & buffer.
24	Existing drain outlet to Myall River.
25	Existing drainage swale
26	Existing shopping centre/medium density approvals
27	Future connecting road

Land Use Legend

Total Site	Ha	%
Open Space		
- Wetlands (zoned 7a)	28.6	12.9
- Buffer Zones (zoned 7b)	21.0	9.4
- Additional Conservation Buffer	17.8	8.0
- Wildlife Corridors	41.9	18.8
- Drainage Corridors, Ponds & Large Parks	23.1	10.4
- Pocket Parks	2.6	1.2
- Existing detention & water quality lake	6.7	3.0
Total	**141.7 Ha**	**63.7%**
Built Upon Area		
- Residential (including roads & community facilities)	67.1	30.2
- Tourist/Residential (Lodgings)	8.1	3.6
Total	**75.2 Ha**	**33.8%**
Future Development Site		
Total	**5.6 Ha**	**2.5%**
Total	**222.5 Ha**	**100%**

Legend

Riverside at Tea Gardens Site Boundary

Source:

Crighton Properties - Concept Plan R.C.- 03/ November 2011 Revision N

Suffix	*Revisions*	*Date*	*Init*
R0	Preliminary Issue	06-12-11	JD

Figure 1.2

Concept Plan for Riverside at Tea Gardens

Client:	Crighton Properties Pty Ltd	
Project:	Concept Plan 2011 Environmental Assessment Riverside at Tea Gardens	
Drawing No:	0043707h_CP_EA_11_CEMP_C003_R0.cdr	
Date:	06/12/2011	Drawing size: A4
Drawn by:	JD	Reviewed by: SO'C
Scale:	Refer to Scale Bar	

N

0 100 200 300 400m

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2 CONSTRUCTION MANAGEMENT

2.1 OBJECTIVES OF THE CEMP

The objectives of the CEMP are to:

- ensure that the construction activities comply with current environmental legislation and best practice environmental management;
- comply with the relevant project approval for the site; and
- minimise the risk to public safety, and to protect the amenity of adjoining residents and the public generally.

2.2 ENVIRONMENTAL MANAGEMENT STRUCTURE AND RESPONSIBILITIES

This plan is to be updated prior to the commencement of construction with appropriate roles and responsibilities relating to environmental management. Tasks and responsibilities are summarised in *Annex A* of this CEMP.

2.3 APPROVAL AND LICENSING REQUIREMENTS

The proposal requires Concept Plan approval from the NSW Minister for Planning under Part 3A of the *Environmental Planning and Assessment Act 1979* (EP&A Act). Construction and subdivision certificates will be required to be obtained once development applications are approved for the various stages of the proposed development under Part 4 of the EP&A Act.

2.4 TRAINING AND SITE INDUCTION

All employees and subcontractors will undergo environmental awareness training as part of the site induction to ensure they understand their obligations and responsibilities under this CEMP. The site induction will include:

- familiarisation with the requirements of the CEMP and other relevant management plans (ie erosion and sediment control plan);
- environmental emergency response procedures; and
- familiarisation with site environmental controls.

Records of all site inductions will be kept and maintained by the site supervisor.

2.5 *EMERGENCY CONTACT AND RESPONSE*

In the event of an environmental emergency, the following person can be contacted 24 hours per day, seven days per week:

Name:	Geoff Cox
Position/Responsibility:	Crighton Properties Managing Director
Contact Number:	02 4352 4352
Alternative Contact Number:	0418 630 519

Emergency services contact details are as follows:

Emergency Hotline:	000
Ambulance:	000
NSW Fire Service:	000
(Tea Gardens) Police Station:	(02) 4997 0244
SES:	13 2500
WIRES (injured wildlife):	0500 559 559

All on-site information relating to hazardous materials, including Material Safety Data Sheets and spill containment materials will be kept at the Site Office.

3 SITE CONTROLS

3.1 PUBLIC SAFETY, AMENITY, AND SITE SECURITY

Procedures for the management of public safety, amenity and site security include:

- all vehicular access/egress associated with the construction works will be via the main site entrance (refer to Sheet 11, *Volume 2* of the Environmental Assessment Report);
- main entrance and site office will be appropriately signposted;
- signage will be placed at site boundary to provide appropriate safety warnings, and include contact details of construction company and/or site supervisor;
- no materials will be stored within the road reserve or placed where it will hinder public access across adjoining public land;
- exposed areas will be kept to a minimum to minimise visual impact as well as reduce air and water pollution; and
- safety fencing will be erected and maintained around specific areas of the work site as appropriate (to be identified in an occupational health and safety plan).

3.2 FLORA AND FAUNA

The following measures are intended to minimise the impact of construction activities on flora and fauna.

- clearing activities will be restricted to only those areas nominated on construction plans for each stage;
- cleared vegetation is to be chipped / mulched on site for reuse in landscaping;
- vehicle movements within uncleared areas will be restricted;
- weed control will be undertaken during construction as required to ensure there is no spread of weeds on or off site;

- prior to construction commencing, areas that are to be retained as corridors and reserves and their adjacent APZ's are to be delineated on site plans and survey marked in the field. This will minimise the risk of damage to vegetation contained within retained areas and APZ's during construction;

- where trees are identified for retention and are in areas adjacent to construction areas, tree protection fencing will be erected to eliminate risk of damage during construction. Fencing will be erected to adequately protect the critical root zone of trees from excavation or compaction damage;

- where corridor or reserve areas are adjacent to construction areas temporary fencing will be erected to indicate these as no go areas. This will be supported by site contractor inductions notifying personnel of protection areas and restricted access to these;

- to minimise the impact on hollow dependant fauna during tree felling operations the following measures will be used were considered appropriate;

    - identification and marking of hollow bearing trees required to be cleared;

    - inspection of tree hollows prior to clearing to determine if hollows are being utilised by tree dwelling fauna, including threatened species. Fauna occupying hollows will be carefully removed by an experienced and licensed fauna expert and relocated to another tree away from the area of clearing;

    - implementation of a trapping program prior to tree clearing to trap any mammal fauna within areas proposed for staged clearing. Any trapped animals will be released into appropriate areas on dusk;

    - restriction of clearing hollow bearing trees during the breeding season for microchiropteran bats and the Squirrel Glider (September-March);

    - implementation of hollow log salvage and re-erection program in order to retain roosting and nesting opportunities for hollow dependent fauna, including Owls, Squirrel Gliders and threatened bat species; and

- two options are available for removing tree hollows or felling hollow bearing trees. These are:

    - hollow bearing trees containing fauna are to be sectionally dismantled. This will be carried out in accordance with Council's established procedure and involve a representative from WIRES and/ or the Project Ecologist;

- where machinery is required to fell hollow trees, the blade or bucket of the machinery will be tapped against the base of the tree to disturb any fauna present. The tree will then be felled as gently as possible. All hollow limbs will be inspected after felling for occupation by fauna. Any fauna will be removed and relocated to adjoining bushland;

- any felling of hollow bearing trees will be supervised by a qualified fauna ecologist with experience in the handling of fauna;

- all hollow limbs will be removed from those trees felled by a licensed contractor. These hollow limbs will be returned to the fauna ecologist for re-use at a later date within the corridor areas of the site; and

- any injured wildlife will be reported to WIRES or similar organisation immediately for rescue.

3.3 NOISE AND VIBRATION CONTROLS

Noise emissions associated with bulk earth works, particularly in relation to the construction of the stormwater quality management at the proposed Riverside Estate, Tea Gardens have the potential to impact on the acoustic amenity of several adjacent residential receptors. The EPA criteria for noise from construction sites are assessed at residential properties and the following are applicable during construction of the subdivision:

- for a cumulative period of exposure to noise from construction activity of between 4 weeks and 26 weeks duration, the LA10 (15minute) noise level emitted by the works, when measured at a residential receiver, should not exceed the LA90 (15minute) RBL more than 10 dBA; and

- for a cumulative period of exposure to noise from construction activity in excess of 26 weeks duration, the LA10 (15minute) noise level emitted by the works, when measured at a residential receiver, should not exceed the LA90 (15minute) RBL by more than 5 dBA.

The Construction Noise Assessment for Riverside at Tea Gardens undertake by ERM (2010) (refer to *Annex B*) recommends the implementation of the following mitigation and management procedures during construction activities:

- where practical, pushing topsoil or fill to form earth mounds between the construction site and residences during initial stripping. Barrier calculations identify that noise levels may be reduced by up to 15 dBA if a 3.5 metre earth mound is established between the sources and residences;

- where possible barriers should be placed nearest to plant and equipment to maximise barrier attenuation;

- maximise the offset distance between noisy plant items and nearby noise sensitive receivers;

- avoiding any coincidence of noisy plant working together in close proximity simultaneously near to sensitive receivers;

- minimising the occurrence of consecutive days works in the same locality;

- orienting noisy plant or equipment away from sensitive areas;

- carrying out loading and unloading away from noise sensitive areas, if loading near sensitive receivers acoustic enclosures or barriers of a suitable height should be constructed to minimise the noise impacts;

- where noise complaints arise, monitor construction noise levels to quantify potential impact at most sensitive residences; and

- the contractor must take reasonable steps to manage and control noise from all plant and equipment. Examples of appropriate noise management and control may include installation of acoustic silencers, low noise mufflers and alternatives to reversing alarms.

No construction activities are to be undertaken outside the operating hours nominated in this plan to minimise the impact of noise on nearby residences.

All combustion engine plants, such as generators, compressors and welders, will be maintained and kept in good working order to ensure they produce minimal noise. Where practical, machines will be operated at low speed or power and switched off when not being used rather than be left idling for prolonged periods.

Machines found to produce excessive noise compared to industry best practice will be removed from the site or stood down until repairs or modifications can be made.

Once noisy construction activity commences close to any residence, it is to be completed with the minimum of undue delay. In any case, all reasonable attempts will be made to complete significant noisy activities within a short period.

While the above measures will not necessarily result in meeting the construction noise criteria, they will serve to reduce impacts to levels most residents will find acceptable considering the relatively short-term nature of construction work.

3.4 AIR AND DUST MANAGEMENT

Management of air quality and dust impacts on the site during construction will include:

- exposed soil areas will be regularly watered down during hot and windy days, or as needed;
- vehicle movements will be restricted to sealed or dedicated areas;
- truck and vehicle speeds will be below 20km/hr on unsealed roads;
- all vehicles containing loads that may generate dust travelling to or from the site will be covered to prevent dust emissions; and
- all site vehicles and machinery will be kept in good working order to minimise exhaust emissions.

3.5 SOIL AND WATER MANAGEMENT

All soil, water and sediment control and management will be undertaken generally in accordance with the requirements of the *Managing Urban Stormwater: Soils and Construction* (Landcom, 2004) (Blue Book). Erosion and sediment control measures will be in place as required until exposed areas are appropriately stabilized following construction.

General requirements for stormwater and sediment control during construction activities include:

- the estate should be developed in stages to minimise the potential for soil erosion and water pollution and enable progressive rehabilitation as the development proceeds;
- sediment control measures are to be installed and maintained throughout all construction areas prior to and during construction activities in accordance with the erosion and sediment control plan;
- all erosion and pollution control devices will be inspected at least weekly and following every rainfall event greater than 5mm, with appropriate maintenance or additional measures initiated as required;
- erosion and sediment control measures must be maintained until landscaping has been completed and becomes established;
- temporary rehabilitation is to be undertaken on disturbed areas where works have stopped and soils are expected to remain exposed for two months;

- as soon as practicable after the completion of earthworks for each stage, lots will be re-seeded to establish a fast growing cover crop which will minimise erosion and movement of sediment across and off site;

- wherever possible, the site will remain grassed and otherwise undisturbed until construction commences;

- topsoil and excess soil will be stockpiled separately in designated areas and protected from surface run off by diversion drains or similar and surrounded on downstream sides by silt fencing. Stockpiles will be suitably compacted in inhibit erosion. Where the stockpiling period exceeds four weeks, the stockpile shall be seeded to encourage vegetative regrowth; and

- entry into the site during construction will be restricted to designated ingress and egress areas.

All rubbish and waste materials will be stored appropriately to ensure they do not enter nearby drains and waterways. Chemicals, oils, and fuels will not be stored on site, or alternatively, will be stored in suitable containers, in a secure storage area.

3.6 ACID SULFATE SOILS

All measures detailed within the Acid Sulfate Soils Management Plan (Coffey, 2011) provided within *Annex C* are to be implemented. A summary of the measures are detailed below:

Management of exposed acid sulphate soils through neutralisation methods. This method applies to sands excavated from below the water table.

Sands would be taken directly from the excavation to the placement site and spread in layers not more than 300mm thick. Lime would be spread over each layer immediately after placement and be thoroughly mixed through the sand using a rotary hoe or similar. The area should not be greater than 1 ha. Fill placement and liming areas would be bunded to allow collection of all leachate and stormwater runoff until test results indicate acceptable levels of neutralisation have been achieved. The collected water should be pumped to a treatment pond as discussed below. Based on the results of SPOCAS / SCR technique analysis it is recommended that sands be treated with lime at a rate of between 1.5kg/tonne to 8kg/tonne. Liming ratios should be confirmed by testing and monitoring at the time of construction. The limed sand may impact on future plant growth and it is recommended that a capping of topsoil be placed over this sand for landscaping purposes.

- Preventing the Oxidiation of ASS. This method of management will apply to clays excavated from proposed detention basins and involves disposal of

the material back into an anaerobic environment (below RL 0m AHD) within proposed drainage reserve areas.

Spoil will be carted directly from excavation to disposal. Attempts will be made to achieve some degree of light compaction such as pressing the material down with an excavator bucket to reduce the occurrence of large voids. A bulking factor of at least 20% to 30% will be allowed for in estimating the volume required for clay ASS disposal.

- Management of Stockpiles - The proposed work program should avoid the necessity to stockpile potential ASS.

If stockpiling becomes necessary, temporary stockpiles should be located in specific approved areas and fully bunded to allow collection and control of leachate. Leachate collected in the bund should be monitored for pH levels and should be pumped to a treatment pond to be neutralised prior to release. Stockpiles should be shaped to minimise the exposed surface area and promote runoff rather than infiltration of rainwater. Bunds are to be constructed from non-ASS material.

- Neutralisation of Leachate and Excavation Water - All leachate from bunded areas and water, including stormwater collected from inflows into excavation areas is to be collected and pumped to treatment ponds.

Once acceptable water quality is achieved, the treated water will be released. Low concentrations of acid leachate requiring treatment is expected given the short time frame of the works and the other construction management practices discussed.

The method of neutralisation is either to add lime as slurry to the water within the treatment pond or to use a mechanical lime spreader to spread lime over a 25m semi-circle close to the inlet point of the treatment pond. The preferred method of neutralisation should be confirmed once salinity of the water can be assessed from background data collected.

The addition of lime should be carried out in conjunction with monitoring to avoid achieving excessively high pH levels. The quality of the water to be finally discharged must meet appropriate guidelines for release to the wetland. These guidelines should be based on statistical evaluation of background water quality data. The size of treatment ponds should be designed to accommodate expected flows from dewatering, excavation inflow and stormwater runoff likely to occur over the period of excavation.

- Monitoring – Monitoring shall be required in each layer of neutralised fill; excavations; and in treatment ponds.

Monitoring of the pH of each layer of completed fill will be required and is to be initially supplemented with a minimum of one standard ASS laboratory test per 1000m^3 of fill placed, with the rate of testing reduced once greater confidence in correlations between field and laboratory test results is

achieved. Testing will be required to produce Total Potential Acidity (TPA) results of zero, or indicating a small amount of excess lime. Laboratory results indicating soil layers containing up to 0.5kg H_2SO_4/tonne would be acceptable provided the subsequent layer produces an excess lime result to avoid a cumulative TPA build up.

The soils exposed in the walls and floor of the excavation should be checked daily for the generation of acid conditions, using an approved field pH screening test. Lime should be added to the exposed surface of the excavation if values of less than pH 4 occur. Water collected in the excavation should also be checked for indications of acid production occurring within the dewatering zone.

Recording of water entering and leaving the proposed treatment pond must be implemented. The following information should be recorded:

- Flow and pH measurements of water pumped into the treatment pond;
- Flow and pH measurements of water discharged from the site as well as general water quality parameters including turbidity, TDS, salinity, chloride / sulfate ratio, aluminium, iron.

Water pumped into the pond will include dewatering pump water, stormwater collected over the construction area, seepages collected in the excavation and leachate collected from the unfinished areas of fill. The pH of the discharged water should be within the range of pH 6 to pH 9 or otherwise within two pH points of the background pH of the receiving water body.

Prior to discharge, laboratory testing should be carried out on water samples, with the testing suite based on the water quality monitoring program carried out in surrounding water bodies. The results should be statistically evaluated against background water quality. Background water quality parameters therefore need to be established prior to the work, as direct comparison against environmental guidelines might be misleading if existing water quality does not compare favourably with such guidelines. The water quality in surrounding water bodies should also be monitored during construction, with the results statistically evaluated against background levels to assess the need for further action.

3.7 WASTE AND MATERIALS RE-USE

The objectives of waste management during construction activities will be to:

- ensure that the construction activities comply with current environmental legislation and best practice environmental management;
- comply with all relevant approvals for the site; and

- minimise the risk to public safety, and protect the amenity of adjoining residents and the public generally.

The consideration of waste minimisation during the design and planning phases of a project is more likely to maximise reuse opportunities and minimise the waste generated.

There are a number of practical techniques outlined in the 'WasteWise Construction Program – Handbook Techniques for reducing construction waste' (Department of the Environment and Heritage, 2005) that assist with construction managers with site waste management. Various procedures will be implemented by the successful contractor including the nomination of an appropriate person to be responsible for waste management.

It is estimated that approximately 230,000m^3 of soil will be generated through site cutting during the construction of the subdivision. All of this will be reused on site for the following purposes:

- filling and shaping in areas of the site where fill material is required, including roads, east / west drainage basin, commercial site regrading, allotments, level spreader and diversion bank construction;

- the creation of earth mounds proposed to be constructed between the Riverside at Tea Gardens construction site and existing residences within the adjacent Myall Quays residential area. The earth mounds will be created at the commencement of construction of the water detention lake as a noise mitigation measure and following construction the mounds will be reshaped to remove the mound and provide a shaped, landscaped area adjacent to the water storage lake; and

- shaping of landscaped and open space areas throughout the Riverside at Tea Gardens site.

The Bulk Earthworks Plan for the development detailing quantities and location of cut and fill works is provided in *Annex D*.

The bulk of topsoil stripped will be reused on the Riverside at Tea Gardens site during rehabilitation and landscaping works. All green waste generated through clearing will be chipped / mulched on site and used in landscaping throughout the site.

To achieve adequate reuse and recycling of materials, appropriate areas for the separation and storage of waste will be provided.

Appropriate training and supervision of staff will be conducted to ensure that the objectives of the waste management plan are implemented and that contamination of the recyclable waste streams is avoided.

The successful construction contractor will ensure any subcontractor's waste streams are also included in the planning process and comply with the CEMP.

Waste segregation is the practice of classifying waste and placing it into the appropriate waste container immediately after the waste is generated. In order to achieve effective recycling and reuse, appropriate waste segregation will be carried out on site.

3.7.1 Avoidance

Purchasing policies will ensure that excessive waste is avoided through simple product substitutions for those with less packaging (or packaging that can be recycled), and avoiding over-ordering of items with expiry periods.

3.7.2 Reduction

Products will be assessed prior to purchase in terms of potential to generate excess waste. Products that include minimal packaging would be favoured, without compromising product performance. Pre-fabricated products that avoid the production off-cuts will be preferred.

3.7.3 Re-Use

Whenever possible, practical and cost effective to do so, re-usable waste from the construction of the first stage of the subdivision will be utilised later in the development. Items that will be considered for reuse include:

- green waste will be mulched, stockpiled, and used in landscaping;
- topsoil will be stripped, stockpiled and reused to revegetate exposed areas following construction and in landscaping;
- excess fill will be used onsite for filling purposes, with remaining soil to be transported to the proposed sporting complex site on the western side of Myall Street and reused in the filling and improvement works required at that site; and
- waste timber, and other suitable items will be reused as formwork.

3.7.4 Recycling

Plastic, paper, cardboard and other recyclable products will be disposed of in dedicated receptacles, and, stored for recycling collection. Pallets, if used, will be stored and returned to the supplier, or recycled.

3.7.5 Waste Management Plan

A preliminary waste management plan has been prepared as shown in *Table* 3.1. It outlines the waste streams expected to be generated during the construction of the subdivision, and outlines the proposed reuse/recycling/ or disposal methods for those waste streams.

Specific areas on site will be dedicated to the storage and segregation of waste. This will include skip bins dedicated to particular recyclable materials (ie scrap metal) with a separate receptacle for mixed waste.

Prior to the construction phase commencing, this plan will be finalised in more detail – including nomination of contractors and specific destinations.

Table 3.1 *Preliminary Construction Waste Management Plan*

Materials Generated On-Site	Destination		
	Reuse and Recycling		Disposal
	On-Site (proposed reuse/recycling method)	Off-Site (contractor/recycling outlet)	Contractor / disposal site
Green waste (from clearing)	Green waste will be chipped / mulched and stockpiled for later use in site landscaping.		
Excavated material	Engineering design will aim to minimised excess fill by balancing cut and fill.	There will be no excess fill and therefore no requirement for offsite reuse.	
Topsoil	Stockpiled on site for reuse in site rehabilitation and landscaping		
Weathered rock	Stockpiled on site for reuse in site landscaping.		
Concrete	Any excess used for footpaths/minor works.	Place in dedicated skip bin – excess will be taken to nearest recycling contractor.	
Timber pallets		To be collected by supplier.	
Timber - other	Ordered to suit - offcuts reused on site ie formwork	Suitable pieces will be taken to nearest recycling contractor.	Only pieces not suitable for recycling will be sent to landfill.
Steel reo	Ordered to suit - offcuts reused.	Place in dedicated skip bin – remove to a metal recycling facility.	
Scrap metal		Place in dedicated skip bin – remove to a metal recycling facility.	
Other - mixed waste			Skip bins will be placed on site, taken to landfill as required.

3.8 TRAFFIC MANAGEMENT

Pedestrian and cycle access is available along Myall Street adjacent to the site. Construction works will impact vehicular traffic and pedestrian flows as the site access way enters Myall Street. The accessway will be signposted with warning signage to alert pedestrians, cyclists and drivers.

The following measures will be taken to minimise any disruption to local traffic during the demolition works:

- all vehicular access/egress associated with the construction works will be via the Myall Street entrance (to be noted to personnel during site inductions);
- staggering the arrival of vehicles where possible;
- heavy vehicle movements to/from the site shall be restricted to the operating hours noted in *Section 1.5*
- oversize vehicle movements will obtain appropriate permits from the Roads & Traffic Authority and comply with any conditions contained therein;
- all vehicles will be accommodated within on-site parking areas;
- all loading and unloading will be carried out within the boundaries of the site;
- use of advisory signage to warn pedestrians and cyclists of heavy vehicle movements; and
- where traffic movements associated with the construction works will cause delays in traffic flows on the surrounding road network, appropriate traffic control plans will be developed and implemented.

REFERENCES

Department of the Environment and Heritage (2005) **WasteWise Construction Program – Handbook Techniques for Reducing Construction Waste.** Australian Government.

Coffey Geotechnics (Coffey), 20011, **Proposed Subdivision, Riverside Estate Tea Gardens, General Acid Sulphate Soil Management Plan.** Report prepared for Crighton Properties Pty Ltd.

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Landcom (2004) **Managing Urban Stormwater: Soils and Construction**, 4th Edition.

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Annex A

Construction Environmental Management Plan Checklist

Table A.1 Construction Environmental Management Plan Checklist

Environmental Management Control	Person Responsible	Timing/Frequency	Completed (Initials/date)	Reference/Notes
General Site Issues				
Conduct site induction training for all personnel to alert them to sensitive work areas, explain the requirements of this CEMP, outline each individual's responsibilities, outline emergency response procedures. Documented evidence to be kept and maintained of site inductions.	Environmental Manager	Before commencing work and ongoing during operations		
Public Safety, Amenity and Site Security				
Ensure all vehicles access site via Myall Street entrance only.	Site Supervisor	Ongoing during operations		CEMP Section 3.1, CEMP Section 3.5
Ensure site compound and Myall Street entrance are clearly signposted.	Site Supervisor	Before commencing work		CEMP Section 3.1
Safety signage erected around site compound and at site entrance.	Safety Manager	Before commencing work		CEMP Section 3.1
No materials are to be stored/placed within public road reserve.	Site Supervisor	Ongoing during operations		CEMP Section 3.1
Areas of work to be kept to minimum required to minimise visual impact (as well as dust emissions and sediment generation).	Site Supervisor	Ongoing during operations		CEMP Section 3.1
Safety fencing erected around work areas in accordance with the site safety plan.	Safety Manager	Before commencing work and ongoing during operations		CEMP Section 3.1
Flora and Fauna				
Clearing activities restricted to only those areas nominated on construction plans for each stage	Site Supervisor	Ongoing during operations		CEMP Section 3.2
Cleared vegetation chipped / mulched on site and reused in landscaping	Environmental Manager	Ongoing during operations		CEMP Section 3.2
Vehicle movements in uncleared areas restricted	Site Supervisor	Before commencing work and ongoing during operations		CEMP Section 3.2

Environmental Management Control	Person Responsible	Timing/Frequency	Completed (Initials/date)	Reference/Notes
Weed control undertaken as required to control spread of weeds on or off site	Environmental Manager	Before commencing work and ongoing during operations		CEMP Section 3.2
Delineation of retained areas (corridors, reserves, APZ's) on site plans and field survey	Environmental Manager	Before commencing work and ongoing during operations		CEMP Section 3.2
Ensure conservation areas are protected with polyweb fencing or similar before commencing vegetation clearing. Maintain fencing during works to keep vehicles out of designated areas.	Environmental Manager	Before commencing work and ongoing during operations		CEMP Section 3.2
Tree protection fencing installed around trees to be retained, including protection of tree root zone	Environmental Manager	Before commencing work and ongoing during operations		CEMP Section 3.2
Temporary fencing installed where construction is adjacent to corridors or reserve areas to delineate area as no go areas	Environmental Manager	Before commencing work and ongoing during operations		CEMP Section 3.2
Hollow bearing trees identified and marked in field prior to clearing	Environmental Manager	Before commencing work and ongoing during operations		CEMP Section 3.2
Inspection of tree hollows prior to clearing to determine use by fauna	Environmental Manager	Before commencing work and ongoing during operations		CEMP Section 3.2
Removal and release (nearby) of fauna from hollows by experienced and licensed fauna expert	Environmental Manager	Ongoing during operations		CEMP Section 3.2
Trapping program undertaken prior to tree clearing to trap any mammal fauna within areas proposed for staged clearing. Fauna to be released in appropriate areas on dusk.	Environmental Manager	Before commencing work and ongoing during operations		CEMP Section 3.2
No clearing of hollow bearing trees during the breeding season for microchiropteran bats and the Squirrel Glider (Sept – Mar)	Environmental Manager	Before commencing work and ongoing during operations		CEMP Section 3.2
Hollow logs cleared are salvaged and re-erected to create roosting / nesting opportunities	Environmental Manager	Ongoing during operations		CEMP Section 3.2
Clearing of hollow bearing trees via sectional dismantling including inspection of each section by a fauna ecologist and removal, released of fauna by qualified expert.	Environmental Manager	Ongoing during operations		CEMP Section 3.2

Environmental Management Control	Person Responsible	Timing/Frequency	Completed (Initials/date)	Reference/Notes
Clearing of hollow bearing trees via felling to include tapping of base of tree to disturb any fauna present prior to felling. All limbs to be inspected following feeling and fauna removed and released in appropriate areas.	Environmental Manager	Ongoing during operations		CEMP Section 3.2
All felling of hollow bearing trees to be supervised by qualified fauna ecologist	Environmental Manager	Ongoing during operations		CEMP Section 3.2
Any injured wildlife is to be reported to a fauna rescue organisation for rescue and care.	Environmental Manager	Before commencing work and ongoing during operations		CEMP Section 3.2
Noise and Vibration				
Plant and equipment maintained and kept in good working order to reduce potential noise impacts	Site Supervisor	Before commencing work and ongoing during operations		CEMP Section 3.3
Where practical, machines operated at low speed or power and switched off when not being used and not left idling for prolonged periods	Site Supervisor	Ongoing during operations		CEMP Section 3.3
Machines producing excessive noise (in comparison to industry standards) removed from the site or stood down until repairs / modifications made	Site Supervisor	Ongoing during operations		CEMP Section 3.3
Barriers placed nearest to plant and equipment to maximise barrier attenuation where possible in areas in close proximity to residences	Site Supervisor	Before commencing work and ongoing during operations		CEMP Section 3.3
Avoiding any coincidence of noisy plant working together in close proximity simultaneously near to sensitive receivers	Site Supervisor	Ongoing during operations		CEMP Section 3.3
Minimising the occurrence of consecutive days work in the same locality	Site Supervisor	Ongoing during operations		CEMP Section 3.3
Maximise the offset distance between noisy plant items and nearby noise sensitive receivers, orienting noisy plant or equipment away from sensitive areas	Site Supervisor	Ongoing during operations		CEMP Section 3.3

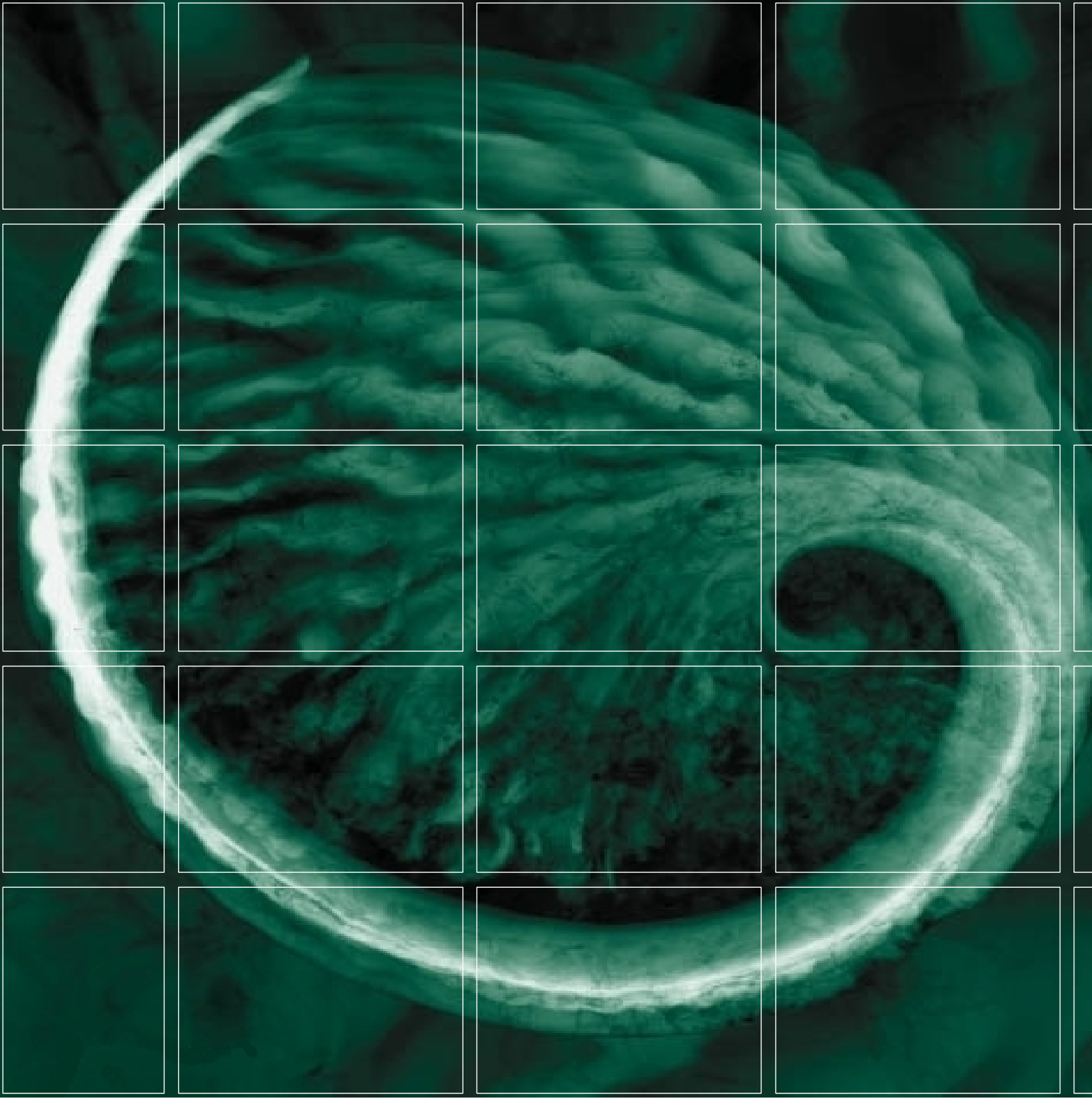
Environmental Management Control	Person Responsible	Timing/Frequency	Completed (Initials/date)	Reference/Notes
Carrying out loading and unloading away from noise sensitive areas. If loading near sensitive receivers, acoustic enclosures or barriers of a suitable height constructed to minimise the noise impacts;	Site Supervisor	Ongoing during operations		CEMP Section 3.3
Where noise complaints arise, monitor construction noise levels to quantify potential impact at most sensitive residences	Environmental Manager	Ongoing during operations as required		CEMP Section 3.3
Check that all work is being conducted within prescribed operation hours.	Site Supervisor	Daily		CEMP Section 1.5
Air Quality				
Check vehicles are keeping to sealed and/or designated areas.	Site Supervisor	Ongoing during operations		CEMP Section 3.4
Check machines are complying with emission standards (i.e. emissions not visible for more than 10 seconds).	Site Supervisor	Ongoing during operations		CEMP Section 3.4
Enforce 20km/h speed limit on unsealed tracks/roads.	Site Supervisor	Ongoing during operations		CEMP Section 3.4
Ensure a mobile water tanker equipped with a pump and sprays is used to suppress dust from unsealed roads when in use and other areas as required.	Site Supervisor	Ongoing during operations		CEMP Section 3.4
All vehicles leaving and entering a site with loads that may generate dust will be covered at all times except during loading/unloading.	Site Supervisor	Ongoing during operations		CEMP Section 3.4
Stormwater and Sediment Control				
Construction works undertaken in stages to minimise potential soil erosion and water pollution and enable progressive rehabilitation	Site Supervisor	Ongoing during operations		CEMP Section 3.5
Sediment control measures installed and maintained throughout all construction areas in accordance with Erosion and Sediment Control Plan and maintained until landscaping is established	Site Supervisor	Prior to commencement of work and inspected weekly thereafter and following every rainfall event greater than 5mm		

Environmental Management Control	Person Responsible	Timing/Frequency	Completed (Initials/date)	Reference/Notes
Temporary rehabilitation undertaken on disturbed areas where works are stopped and soils are expected to remain exposed for two months	Site Supervisor	Ongoing during operations		
Lots re-seeded with a fast growing cover crop immediately following completion of earthworks	Site Supervisor	Ongoing during operations		
Site remained grassed and undisturbed until construction commences, wherever possible	Site Supervisor	Prior to commencement of work		
Topsoil / excess soil stockpiles separated in designated area and sediment control devices installed (eg diversion drains, silt fencing). Stockpiles compacted to reduce erosion and where stockpiling exceeds four months, stockpile is seeded to encourage vegetative growth	Site Supervisor	Ongoing during operations		
Ensure all hazardous materials are appropriately stored.	Site Supervisor	Prior to commencement of work		CEMP Section 3.5
Acid Sulphate Soils				
All measures detailed within the Acid Sulphate Soils Management Plan (Coffey, 2007) are implemented.	Environmental Manager	Before commencing work and ongoing during operations		CEMP Section 3.6
Waste Management				
During clearing, vegetation will be stockpiled for mulching and use in landscaping on-site.	Environmental Manager	During clearing operations		CEMP Section 1.5, CEMP Section 3.7
Topsoil and excess fill will be reused on site wherever possible.	Site Supervisor	Prior to commencement of work		CEMP Section 3.7
Waste materials will be reused on site wherever possible prior to recycling or disposal.	Site Supervisor	Prior to commencement of work		CEMP Section 3.7
Provide an area for the segregation, storage and recycling of waste.	Site Supervisor	Prior to commencement of work		CEMP Section 3.7

Environmental Management Control	Person Responsible	Timing/Frequency	Completed (Initials/date)	Reference/Notes
Traffic Management				
Heavy vehicle movements to/from the site shall be restricted to the operating hours.	Site Supervisor	Ongoing during operations		CEMP Section 3.8
Oversize vehicle movements will obtain appropriate permits from the Roads & Traffic Authority and comply with any conditions contained therein.	Site Supervisor	Ongoing during operations		CEMP Section 3.8
Ensure the main access is not used for parking, loading, marshalling or standing of any semi-trailer, heavy plant floats or wide loads.	Site Supervisor	Ongoing during operations		CEMP Section 3.8
Ensure all vehicles can be accommodated within on-site parking areas.	Site Supervisor	Prior to commencement		CEMP Section 3.8
All loading and unloading will be carried out within the boundaries of the site.	Site Supervisor	Ongoing during operations		CEMP Section 3.8
Erect advisory signage to warn pedestrians and cyclists of heavy vehicle movements.	Site Supervisor	Prior to commencement		CEMP Section 3.8
Where traffic movements associated with the construction works will cause delays in traffic flows on the surrounding road network, appropriate traffic control plans will be developed and implemented.	Site Supervisor	Ongoing during operations		CEMP Section 3.8

Annex B

Construction Noise Assessment



Riverside at Tea Gardens

Construction Noise Assessment

For Crighton Properties Pty Ltd

July 2008

0043707 FINAL

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Delivering sustainable solutions in a more competitive world

ERM

Prepared by:	*Oliver Muller*
Position:	Senior Scientist - Acoustics
Signed:	
Date:	*2 July 2008*
Approved by:	*Steve O'Connor*
Position:	Project Director
Signed:	
Date:	*2 July, 2008*

Environmental Resources Management Australia Pty Ltd Quality System

Riverside at Tea Gardens

Construction Noise Assessment

For Crighton Properties Pty Ltd

July 2008

0043707FINAL

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CONTENTS

LIST OF FIGURES

1 CONSTRUCTION NOISE ASSESSMENT

1.1 INTRODUCTION

Noise emissions associated with bulk earth works, particularly in relation to the construction of the fresh stormwater quality management and detention ponds at the proposed Riverside Estate, Tea Gardens have the potential to impact on the acoustic amenity of several adjacent residential receptors.

ERM have completed an acoustical assessment to determine the extent of noise impacts associated with these construction activities. *Figure 1.1* presents a locality plan identifying the proposed stormwater quality management ponds. This assessment focuses on existing residences in the northern section of Leeward Circuit, Tea Gardens, as identified on *Figure 1.1*.

This assessment has been prepared with reference to the Department of Environment and Climate Change (DECC) NSW Industrial Noise Policy (INP, 2000) and the Environmental Noise Control Manual (ENCM).

Legend

- Riverside at Tea Gardens Site Boundary
- Proposed Stormwater Ponds
- Attended Measurement Location (residence)
- Assessed Distances of Construction Works

Source:

Crighton Properties - Concept Plan R.C.-03 October 2010

Suffix	*Revisions*	*Date*	*Init*
R0	Preliminary Issue	15-11-10	JD

Figure 1.1

Locality Plan

Client:	Crighton Properties Pty Ltd	
Project:	Concept Plan 2010 Environmental Assessment Riverside at Tea Gardens - Noise Assessment	
Drawing No:	0043707h_CP_EA_N_C001_R0.cdr	
Date:	15/11/2010	Drawing size: A4
Drawn by:	JD	Reviewed by: OM
Scale:	Refer to Scale Bar	

N

0 50 100 150m

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53 Bonville Avenue, Thornton, NSW 2322
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ERM

2 *GLOSSARY*

A number of technical terms used in this report describe various noise levels. These terms are explained in *Table 2.1*.

Table 2.1 Glossary of Terms

Term	Description
ABL	Assessment Background Level (ABL) is defined in the INP as a single figure background level for each assessment period (day, evening and night). It is the tenth percentile of the measured L_{90} statistical noise levels.
dB(A)	Noise is measured in units called decibels (dB). There are several scales for describing noise, the most common being the 'A-weighted' scale. This attempts to closely approximate the frequency response of the human ear.
dB(LinPeak)	The peak sound pressure level (not RMS) expressed as decibels with no frequency weighting.
L1	The noise level exceeded for 1 % of a measurement period.
L10	A noise level which is exceeded 10 % of the time. It is approximately equivalent to the average of maximum noise levels.
L90	Commonly referred to as the background noise, this is the level exceeded 90 % of the time.
Leq	*The summation of noise over a selected period of time. It is the energy average noise from a source, and is the equivalent continuous sound pressure level over a given period.*
Lmax	The maximum root mean squared (rms) sound pressure level received at the microphone during a measuring interval.
RBL	The Rating Background Level (RBL) is an overall single figure background level representing each assessment period over the whole monitoring period. The RBL is used to determine the intrusiveness criteria for noise assessment purposes and is the median of the ABL's.
Sound power level	This is a measure of the total power radiated by a source. The sound power of a source is a fundamental location of the source and is independent of the surrounding environment.
Temperature inversion	A positive temperature gradient. A meteorological condition where atmospheric temperature increases with altitude to some height.

3 CONSTRUCTION NOISE EMISSION CRITERIA

The DECC's current guidelines for construction are described below and apply to residential receivers only:

3.1.1 Working Hours

The primary objective of the DECC is to limiting audible construction working hours to:

- Monday to Friday - 0700 hours to 1800 hours
- Saturday - 0800 hours to 1300 hours
- No work on Sundays or Public Holidays
- Noise Levels

To determine the likelihood of impact, the provide noise level based criteria. DECC guidelines set out methods for determining construction criteria associated with proposed developments. *Table 3.1* summarises the construction noise criteria with respect to the rating background noise level (RBL) based on duration that applies to nearest sensitive receivers.

Table 3.1 Construction Noise Goals

Construction Period	Acceptable LA10 Noise Level[1]
4 weeks and under	Background LA90 plus 20 dBA
4 weeks to 26 weeks	Background LA90 plus 10 dBA
Greater than 26 weeks	Background LA90 plus 5 dBA

For a cumulative period of exposure to noise from construction activity of up to four (4) weeks in duration, the LA10 (15minute) noise level emitted by the works, when measured at a residential receiver, should not exceed the LA90 (15minute) RBL by more than 20 dBA.

For a cumulative period of exposure to noise from construction activity of between 4 weeks and 26 weeks duration, the LA10 (15minute) noise level emitted by the works, when measured at a residential receiver, should not exceed the LA90 (15minute) RBL more than 10 dBA.

For a cumulative period of exposure to noise from construction activity in excess of 26 weeks duration, the LA10 (15minute) noise level emitted by the works, when measured at a residential receiver, should not exceed the LA90 (15minute) RBL by more than 5 dBA.

4 ATTENDED NOISE MONITORING RESULTS

4.1 ATTENDED NOISE MONITORING RESULTS

To gain an understanding of the existing noise environment ERM conducted attended noise monitoring during calm clear weather conditions to ascertain dominate ambient noise sources and to quantify existing noise contributions. Fifteen minute noise measurements were undertaken using a Brüel and Kjær Type 2250 one-third octave integrating sound level meter (see results in *Table 4.1*). Calibration of the instrument was undertaken using a Brüel and Kjær type 4231 calibrator.

Table 4.1 Attended Noise Survey Results – 4 April 2008

Monitoring Location Time	Primary Noise Descriptor (dBA ref 20µPa)					Observations, Description of Noise Emissions (dBA)
	LAmax	LA1	LA10	LAeq	LA90	
Opposite 52 Leeward Circuit, Tea Gardens 10:38 am	66	51	44	43	38	Distant Road Traffic (Myall Street) 30 to 40 Birds 36 to 48 Wind 37 to 40

1. Meteorological conditions at the time of the survey were calm and clear. (Temp 20^{o}C, Wind Speed 2m/s NW)

4.2 CONSTRUCTION NOISE CRITERIA

The construction phase of this project is expected to occur for a period of between 4 weeks and 26 weeks duration.

Therefore in accordance with the DECC guidelines, the construction noise goals are set to background plus 10 dBA (LA90 + 10dBA). Therefore, the following noise criteria shown in *Table 4.2* for construction apply. It should be noted that the DECC rarely set noise limit based restrictions for construction sites. Therefore, the construction limits should be seen as an indicative goal for the development.

Table 4.2 Construction Noise Goals (between 4 weeks to 26 weeks construction period)

Location	Project Specific Noise Criteria L10(15minute)
All Receivers	48 dBA

1. Construction may only occur between the hours of 7.00 am and 6.00 pm Monday to Friday, and 8.00 am to 1.00 pm Saturdays. For all other times construction noise must be inaudible at the receiver.

5 NOISE IMPACT ASSESSMENT

5.1 PROPOSED CONSTRUCTION OPERATIONS

Several items of mobile construction plant and equipment are proposed to be used during construction of the stormwater management and detention ponds associated with the Riverside Estate.

The noise assessment calculated the received L10 noise levels at nearby sensitive receptors. It should be noted that this assessment has assumed that all plant and equipment operate simultaneously. In practice, such an operating scenario would be unlikely to occur and the results should therefore be considered conservatively high. Where relevant, modifying factors in accordance with Section 4 of the INP have been applied to calculations.

Table 5.1 presents the items of plant along with the overall sound power level (SWL) adopted in this assessment.

Table 5.1 *Sound Power Levels (SWL) of Construction Plant*

Proposed Mobile Items	Sound Power Level (dB(A))
CAT D9N Dozer	113
CAT 825 Compactor	110
Volvo A30 Haul Truck	105
Volvo A40 Haul Truck	105
CAT 631 Scraper	111
Komatsu PC300 Excavator	103
Komatsu PC450 Excavator	105

Note : Sound power levels were obtained from the ERM database of noise sources.

5.2 RESULTS

Construction noise impacts were assessed from two distances representing the near and far distances of construction positions of the stormwater quality/detention ponds from residences within Leeward Circuit, Tea Gardens. Results for both distances are represented as highest (at 40 metres) and lowest (at 280 metres), additionally, plant was assessed at the existing ground surface at the same level as nearby residences and when at lower levels when in the base of the proposed ponds (up to 3.5 m below current ground surface levels). The results of the assessment for both scenarios are presented in *Table 5.2*.

Table 5.2 Calculated Construction Noise Emissions

Receptor	Highest L10 Noise Impact dB(A)	Lowest L10 Noise Impact dB(A)	Construction Noise Criteria L10 dB(A)
Leeward Circuit, Tea Gardens.	76	45	48

Calculations of noise emissions associated with the construction of the Riverside stormwater quality/detention ponds identify that the construction noise criteria would be exceeded when plant items are stripping the surface soils, although would reduce significantly when are at lower depths within the lower areas of the proposed ponds. To minimise the potential acoustic impacts of construction activities on nearby residences, it is recommended that the management and mitigation activities (described in *Chapter 6*) be implemented as part of the construction process.

6 *CONSTRUCTION MITIGATION AND MANAGEMENT*

To minimise the impacts of construction noise emissions on nearby residences in Leeward Circuit, Tea Gardens during construction of the Riverside stormwater quality/detention ponds, it is recommended the following mitigation and management procedures be implemented:

- where practical, pushing topsoil or fill to form earth mounds between the construction site and residences during initial stripping. Barrier calculations identify that noise levels may be reduced by up to 15 dBA if a 3.5 metre earth mound is established between the sources and residences;

- where agreement can be reached negotiated agreements between developers and residents in close proximity to the proposed works should be established;

- where possible barriers should be placed nearest to plant and equipment to maximise barrier attenuation;

- maximise the offset distance between noisy plant items and nearby noise sensitive receivers;

- avoiding any coincidence of noisy plant working together in close proximity simultaneously near to sensitive receivers;

- minimising the occurrence of consecutive days works in the same locality;

- orienting noisy plant or equipment away from sensitive areas;

- carrying out loading and unloading away from noise sensitive areas, if loading near sensitive receivers acoustic enclosures or barriers of a suitable height should be constructed to minimise the noise impacts;

- where noise complaints arise, monitor construction noise levels to quantify potential impact at most sensitive residences; and

- the contractor must take reasonable steps to manage and control noise from all plant and equipment. Examples of appropriate noise management and control may include installation of acoustic silencers, low noise mufflers and alternatives to reversing alarms.

7 *CONCLUSION*

ERM has completed a noise impact assessment for the proposed construction activities associated with of proposed stormwater quality management ponds adjacent to residence situated in Leeward Circuit, Tea Gardens, NSW.

Noise levels associated with construction are likely to be above the relevant construction noise criteria during initial stages, although when operations are at lower levels within the proposed ponds noise levels would reduce significantly. To minimise impacts on residences during construction, management and mitigation strategies provided in this assessment would significantly reduce impacts on nearby residences.

REFERENCES

Environment Protection Authority of NSW (1994), Environmental Noise Control Manual (ENCM).

Environment Protection Authority of NSW (January 2000), Industrial Noise Policy.

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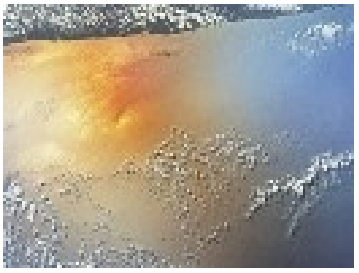


Annex C

Acid Sulphate Soil Management Plan

coffey geotechnics
SPECIALISTS MANAGING THE EARTH

PROPOSED SUBDIVISION - RIVERSIDE ESTATE PROJECT APPLICATION AND CONCEPT PLAN AREA, TEA GARDENS
ACID SULFATE SOIL MANAGEMENT PLAN

Tattersall Lander Pty Ltd

GEOTWARA21006AB-Appendix C
4 April 2011

Coffey Geotechnics Pty Ltd ABN 93 056 929 483
19 Warabrook Boulevard Warabrook NSW 2304 Australia

coffey geotechnics
SPECIALISTS MANAGING THE EARTH

4 April 2011

Tattersall Lander Pty Ltd
PO Box 54
RAYMOND TERRACE NSW 2324

Attention: Bob Lander

Dear Bob

RE: PROPOSED SUBDIVISION

RIVERSIDE ESTATE PROJECT APPLICATION AND CONCEPT PLAN AREA

TEA GARDENS

ACID SULFATE SOIL MANAGEMENT PLAN

Please find enclosed an acid sulfate soils management plan for the above project.

If you have any questions regarding this matter please contact the undersigned.

For and on behalf of Coffey Geotechnics Pty Ltd.

Arthur Love

Principal Geotechnical Engineer

CONTENTS

1 INTRODUCTION

As requested Coffey Geotechnics Pty Ltd (Coffey) has prepared an Acid Sulfate Soil (ASS) Management Plan for earthworks associated with the proposed Riverside Estate Project Application and Concept Plan area development, Tea Gardens.

The ASS Management Plan has been prepared using field and laboratory test results reported in Coffey Report No. GEOTWARA21006AB-AA, dated 4 April 2009.

2 SITE CONDITIONS

The site is located at Tea Gardens, on the New South Wales mid north coast, within the Great Lakes Council local government area. The site is bounded by Toonang Drive and an existing residential subdivision to the north, undeveloped low lying land adjoining the Myall River to the east, the recently constructed Myall Quays Estate to the south and Myall Way to the west.

The total site area is 222.5 ha and comprises the proposed development over approximately half of this area within a concept plan application.

Topographically the site is located on a low sand plain. The site is flat to slightly sloping and is subject to prolonged water logging during periods of wet weather. Surface elevations across the site range from about RL0.75m AHD in the south eastern corner of the site to about RL5m near the northern site boundary.

The majority of the site has been cleared, with vegetation comprising an established cover of medium to tall grasses and scattered medium sized eucalypts.

Geologically, the site is located within a region of windblown sand deposits probably of Pleistocene age (i.e. greater than 20,000 years old). The subsurface profile encountered in Coffey's report referenced above revealed four material types:

- TOPSOIL – Silty Clayey SAND, Silty SAND and Silty CLAY / Silty Sandy CLAY, root affected;
- CLAY – A discontinuous layer of Sandy CLAY, CLAY and Clayey SAND, typically encountered to a maximum depth of <2.0m;
- SAND – fine to medium grained, pale grey to white, pale grey brown, grey brown and dark brown;
- INDURATED SAND – Clayey SAND and Silty SAND, fine to medium grained, dark brown, pale brown and orange brown.

Groundwater or groundwater inflows were encountered at depths of between 0.3m to 2.3m.

Test pit and borehole locations are shown on Figure 1.

3 PROPOSED DEVELOPMENT

The proposed Riverside Estate Project Application is understood to involve the subdivision of the site into a total of 390 dwellings, including dual occupancy dwellings and small lot / medium density development and construction of associated subdivision roads.

The proposed Riverside Estate Concept Plan area is located to the north and north east of the Riverside Estate Project Application and is understood to involve the subdivision of the site.Development of residential lots will involve filling to raise surface levels above a minimum requirement of RL 2.1m AHD.Excavations proposed as part of the development are associated with the creation of numerous drainage basins and will be to a minimum level of RL-2.7m AHD, involving excavation up to a maximum depth of about 5m.

Plans showing the extent, depth and volume of proposed excavations are attached to Coffey's report referenced above.

4 PRESENCE OF ACID SULFATE SOILS

Acid sulfate soils (ASS) are soils which contain significant concentrations of pyrite which, in the presence of sufficient moisture, oxidises when exposed to oxygen, resulting in the generation of sulfuric acid. For the purposes of assessment, potential ASS are indicated by pH<3 upon oxidation in hydrogen peroxide or laboratory test results which exceed a range of Action Criteria presented in the ASS Assessment Guidelines.

Engineering logs of test pits and boreholes are presented in Appendix A of Coffey's report referenced above. The results of screening tests and laboratory SPOCAS / SCR technique analysis are presented in Appendix B of the same report.

Laboratory test results for samples sent for SPOCAS / SCR technique analysis are summarised in Table 1. These results indicate that some samples tested from both the clay layer and sands show low ASS potential and that their occurrence across the site is sporadic.

TABLE 1 – SUMMARY OF ASS TEST RESULTS

TEST LOCATION	**SAMPLE DEPTH (m)**	**GEOTECH. UNIT**	**SCREENING TEST RESULT**		**S_{POS} / S_{CR} (%)**	**TPA / NET ACIDITY (mol H+ / tonne)**
			pH_F	pH_{FOX}		
TP6	2.0 – 2.1	UNIT 3	4.94	4.06	0.02	16
TP14	0.6 – 0.7	**UNIT 2**	5.20	3.26	**0.14**	**84**
TP19	0.5 – 0.6	UNIT 2	4.96	3.70	**0.08**	**49**
TP25	1.9 – 2.0	**UNIT 4**	4.36	3.26	**0.12**	**76**
TP26	1.5 – 1.6	UNIT 3	4.71	**2.60**	<0.02	<10
TP27	1.1 – 1.2	**UNIT 3**	4.47	3.35	**0.03**	**21**
TP28	0.6 – 0.7	**UNIT 4**	4.95	3.55	**0.08**	**53**

TEST LOCATION	SAMPLE DEPTH (m)	GEOTECH. UNIT	SCREENING TEST RESULT		S_{POS} / S_{CR} (%)	TPA / NET ACIDITY (mol H+ / tonne)
			pH_F	pH_{FOX}		
TP30	1.5 – 1.6	**UNIT 3**	5.25	**2.81**	**0.09**	**58**
TP32	1.6 – 1.7	**UNIT 2**	6.40	**1.43**	**0.13**	**84**
TP33	1.1 – 1.2	**UNIT 2**	6.34	**1.45**	**0.12**	**77**
TP34	1.0 – 1.1	**UNIT 2**	6.35	**1.36**	**0.19**	**117**
BH36	0.5 – 1.0	**UNIT 3**	5.03	4.24	**0.04**	**26**
BH36	3.5 – 4.0	UNIT 3	5.75	3.26	<0.02	11
BH37	0.5 – 1.0	UNIT 3	5.85	4.67	0.02	14
BH37	2.0 – 2.5	**UNIT 3**	5.55	3.92	**0.07**	**44**
BH37	5.0 – 5.5	**UNIT 4**	5.83	3.27	**0.15**	**93**
BH37	6.5 – 7.0	**UNIT 4**	5.73	3.07	**0.17**	**104**
BH38	0.5 – 1.0	**UNIT 2**	5.19	4.20	**0.24**	**147**
BH38	6.5 – 7.0	UNIT 3	5.63	4.26	<0.02	11
TP39	1.0 – 1.1	**UNIT 2**	6.75	3.86	0.006	**56**
TP40	1.5 – 1.6	UNIT 3	5.90	4.73	<0.005	9
TP41	0.5 – 0.6	**UNIT 2**	5.20	3.86	<0.005	**39**
TP42	1.0 – 1.1	**UNIT 2**	5.25	4.19	0.007	**37**
TP43	1.7 – 1.8	UNIT 3	5.83	5.18	<0.005	7
BH45	5.5 – 5.9	**UNIT 3**	6.17	4.80	0.011	**22**
BH46	1.0 – 1.1	**UNIT 3**	6.57	**2.28**	0.028	**20**
BH46	2.5 – 3.0	**UNIT 3**	6.70	4.38	0.016	**18**

TEST LOCATION	SAMPLE DEPTH (m)	GEOTECH. UNIT	SCREENING TEST RESULT		S_{POS} / S_{CR} (%)	TPA / NET ACIDITY (mol H+ / tonne)
			pH_F	pH_{FOX}		
BH46	5.5 – 6.0	UNIT 3	7.68	5.33	0.013	10
ASSMAC Action Criteria	-	-	-	-	0.1* 0.03**	62* 18**
Levels of Concern for Screening Test	-	-	4	3	-	-

NOTE:

** Action criteria shown are those for fine textured soils (ie clays) and management of excavations involving disturbance of less than 1000 tonnes of soil;*

*** Action criteria shown are those for course textured soils (ie sands) and management of excavations involving disturbance of more than 1000 tonnes of soil;*

S_{POS} – Percentage of oxidisable Sulfur;

S_{CR} – Percentage of chromium reducible Sulfur;

TPA – Total Potential Acidity.

Based on the results shown in Table 1, expected acid generation rates for oxidation of sand and clay are summarised in Table 2, together with ratios of lime which would be required to neutralise the effects of acid production.

TABLE 2 – SUMMARY OF POTENTIAL ACID GENERATION RATES

MATERIAL	SAND	CLAY
ACID GENERATION (kgH_2SO_4/tonne)		
Maximum	5.2	7.4
Minimum	1.0	1.8
Mean*	2.5	3.8

MATERIAL	SAND	CLAY
LIME RATIOS** (kg/tonne)		
Maximum	7.8	11.1
Minimum	1.5	2.7
Mean*	3.8	5.7
NOTES:		
** - Arithmetic mean value, not weighted to take into account expected volume or mass;*		
*** - Based on a factor of safety of 1.5.*		

Assuming a bulk density of 1.8 tonne/m^3 in the sands and 1.6 tonne/m^3 in the clays, the neutralisation treatment of the sand and clay would require an average of 7kg lime/m^3 and 9kg lime/m^3.

5 PROPOSED CONSTRUCTION METHOD

In summary the proposed development involves filling of residential lots and associated roads and excavating numerous drainage basins. It is understood that excavations are proposed to be carried out in the dry. Dry excavation is preferred over dredging for the following reasons:

- A cutter suction dredge would have difficulty achieving the required batters;
- Local contractors are more experienced in dry excavation;
- Previous excavations on the adjoining Myall Quays Estate were constructed in the dry;
- The costs of excavation in the dry are much lower than dredging;
- The dry excavation could be carried out more quickly and efficiently;
- Dry excavation allows visible recognition of clay during excavation, promoting easier separation and treatment.

A shallow excavation of about 0.9m maximum depth and 60m^3 volume associated with a proposed extension of an existing outlet drain is also proposed immediately to the south of the site. This excavation is located adjacent to an existing saline lake that was previously excavated as part of the adjoining Myall Quays Estate development.

Construction works will be staged and will comprise the creation of drainage basins and branches initially as indicated on the Tattersall Lander's Construction Activity Staging Plan attached to Coffey's report referenced above. The duration of the works is not known, however based on previous experience construction of each of the larger drainage basins is expected to take less than about two months.

6 BASIS OF MANAGEMENT PLAN

6.1 Acid Sulfate Soils (ASS) Issues

The proposed method of construction raises the following ASS related issues that need to be addressed:

- The oxidation of potential ASS exposed in the excavation spoil;
- The oxidation of potential ASS exposed on the walls of the excavation;
- Possible oxidation of potential ASS within the dewatering zone;
- Migration of ASS impacted groundwater from the dewatering zone to off site receptors;
- Disposal of possibly ASS affected leachate and excavation water.

6.2 ASS Management Rationale

The majority of excavated spoil is expected to comprise sands, however clays will also be excavated in some areas. Sands are more readily workable from an engineering perspective and are more easily treated by the addition of lime from an ASS neutralisation perspective than clays. For this reason, it is understood that sands are proposed to be reused as fill and clays are proposed to be disposed of on site below the water table, hence preventing exposure and oxidation. This was also the rationale used during construction of the adjoining Myall Quays Estate.

It is therefore proposed to excavate sands from a suitably located on site borrow and disposal area to sufficient depth to provide adequate storage volume below the water table for disposal of clays encountered. The sand excavated from the proposed disposal area could then be treated with lime and reused as fill material.

Short term oxidation of ASS exposed at the face of the excavation is generally confined to that soil located within a few millimetres of the excavation face. The thickness of the oxidation zone varies, being generally thinner in clays than sands. The oxidation and acidification process is not completely understood but it is known that the process does not occur instantaneously in natural conditions, instead requiring some time. Therefore, significant acid production from the potential ASS at the face of excavations is not likely to occur during the expected construction timeframe. It is considered that the small amount of acid generation which would be expected to occur could be managed by pH monitoring at the face of the excavation with a standby supply of lime provided to allow implementation of contingency measures should unacceptable monitoring results occur.

Other potential ASS within the dewatering zones would be overlain by at least 0.5m of soil cover and are considered unlikely to oxidise to a degree that would produce acid sulfate conditions within the proposed construction timeframe. This risk can be managed by monitoring of groundwater and surface water pH during construction.

The dewatering process will lower the water table in the excavation areas and this will have the effect of drawing surrounding groundwater towards the excavation during construction. Off site migration of groundwater during construction is therefore not expected during the works.

7 ACID SULFATE SOIL MANAGEMENT PLAN

7.1 Preventing Oxidation of ASS

This method of management will apply to clays excavated from proposed detention basins and involves disposal of the material back into an anaerobic environment (below RL 0m AHD) within proposed drainage reserve areas. The spoil will be carted directly from excavation to disposal. The clay will probably excavate as large blocks, which retain the shape of the excavator bucket on disposal. Attempts will be made to achieve some degree of light compaction such as pressing the material down with an excavator bucket to reduce the occurrence of large voids, thereby reducing potential for oxidation during the construction process and also avoiding excessive bulking and subsequent settlements. It is anticipated that bulking of the order of 20% would occur due to the loose dumping of the material into the excavation and a bulking factor of at least 20% to 30% will be allowed for in estimating the volume required for clay ASS disposal.

7.2 Neutralisation by Lime

This method will apply to sands excavated from below the water table. Sands should be taken directly from the excavation to the placement site and spread in layers not more than 300mm thick. Lime should be spread over each layer immediately after placement and be thoroughly mixed through the sand using a rotary hoe or similar. The liming should be confined to areas of a manageable size (maximum 1 ha). Fill placement and liming areas should be bunded to allow collection of all leachate and stormwater runoff until test results indicate acceptable levels of neutralisation have been achieved. The collected water should be pumped to a treatment pond as discussed in Section 7.4 of this plan.

Good quality fine agricultural lime should be used. Based on the results of SPOCAS / SCR technique analysis it is recommended that sands be treated with lime at a rate of between 1.5kg/tonne to 8kg/tonne. This quantity of lime includes a factor of safety of 1.5 to take into account the rate of lime reactivity and the possibility of inhomogeneous mixing. Liming ratios should be confirmed by testing and monitoring at the time of construction. The limed sand may impact on future plant growth and it is recommended that a capping of topsoil be placed over this sand for landscaping purposes.

7.3 Management of Stockpiles

The proposed work program should avoid the necessity to stockpile potential ASS. If circumstances are such that stockpiling becomes necessary, temporary stockpiles should be located in specific approved areas and fully bunded to allow collection and control of leachate. Leachate collected in the bund should be monitored for pH levels and should be pumped to a treatment pond to be neutralised prior to release. Stockpiles should be shaped to minimise the exposed surface area and promote runoff rather than infiltration of rainwater. Bunds are to be constructed from non-ASS material.

7.4 Neutralisation of Leachate and Excavation Water

All leachate from bunded areas, water collected from inflows into excavations and stormwater collected from the excavation and stormwater collected from excavation areas is to be collected and pumped to treatment ponds. Once acceptable water quality is achieved, the treated water will be released. It is anticipated that the short time frame of the works and the construction management practices discussed in this document should result in low concentrations of acid leachate requiring treatment.

The method of neutralisation is either to add lime as a slurry to the water within the treatment pond (depending on the salinity of the water to be treated) or to use a mechanical lime speader to spread lime over a 25m semi circle close to the inlet point of the treatment pond.

The preferred method of neutralisation should be confirmed once salinity of the water can be assessed from background data collected. The addition of lime should be carried out in conjunction with monitoring to avoid achieving excessively high pH levels. The quality of the water to be finally discharged must meet appropriate guidelines for release to the wetland. These guidelines should be based on statistical evaluation of background water quality data. The size of treatment ponds should be designed to accommodate expected flows from dewatering, excavation inflow and stormwater runoff likely to occur over the period of excavation.

7.5 Monitoring Program

Monitoring will be required in the following areas:

- In each layer of neutralised fill;
- In excavations;
- In treatment ponds.

7.5.1 Fill Monitoring

Field monitoring of the pH of each layer of completed fill will be required and is to be initially supplemented with a minimum of one standard ASS laboratory test per 1000m^3 of fill placed, with the rate of testing reduced once greater confidence in correlations between field and laboratory test results is achieved. Testing will be required to produce Total Potential Acidity (TPA) results of zero, or indicating a small amount of excess lime. Laboratory results indicating soil layers containing up to 0.5kg H_2SO_4/tonne would be acceptable provided the subsequent layer produces an excess lime result to avoid a cumulative TPA build up.

No layer of fill is to covered by a subsequent layer until field screen tests indicate that the minimum soil acidity level has been achieved.

As a guide during construction, field screening tests should be carried out on the fill placed on the site to check for ASS conditions in accordance with methods 21Af and 21Bf of Reference 2.

7.5.2 Excavation Monitoring

The soils exposed in the walls and floor of the excavation should be checked daily for the generation of acid conditions, using an approved field pH screening test. Lime should be added to the exposed surface of the excavation if values of less than pH 4 occur. Water collected in the excavation should also be checked for indications of acid production occurring within the dewatering zone. Contingency measures should be put in place in accordance with Section 7.6 of this plan if water pH values of less than pH 4 occur.

7.5.3 Water Quality Monitoring

Recording of water entering and leaving the proposed treatment pond must be implemented. The following information should be recorded:

- Flow and pH measurements of water pumped into the treatment pond;
- Flow and pH measurements of water discharged from the site as well as general water quality parameters including turbidity, TDS, salinity, chloride / sulfate ratio, aluminium, iron.

Water pumped into the pond will include dewatering pump water, stormwater collected over the construction area, seepages collected in the excavation and leachate collected from the unfinished areas of fill. The pH of the discharged water should be within the range of pH 6 to pH 9 or otherwise within two pH points of the background pH of the receiving water body.

Prior to discharge, laboratory testing should be carried out on water samples, with the testing suite based on the water quality monitoring program carried out in surrounding water bodies. The results should be statistically evaluated against background water quality. Background water quality parameters therefore need to be established prior to the work, as direct comparison against environmental guidelines might be misleading if existing water quality does not compare favourably with such guidelines. The water quality in surrounding water bodies should also be monitored during construction, with the results statistically evaluated against background levels to assess the need for further action.

7.5.4 Contingency Measures

Soil acidity in the completed fill layers will be monitored. Should the field pH tests and the laboratory tests (initially one lab test per 1000m3) show that the soil acidity has not achieved the minimum required standard, then that layer must be reworked and additional lime treatment carried out until it is verified that the layer comes up to the required standard. No layer of fill is to be covered by a subsequent layer until the field screening tests indicate that the minimum soil acidity level has been achieved.

If monitoring of the water in the ponds at the point of discharge indicates the pH is below acceptable discharge limits then discharge from the ponds must immediately cease and further treatment be carried out. Monitoring of leachate entering the ponds is to be carried out to detect discharges of acid leachate to the ponds, in which event the lime neutralisation of the leachate should occur in isolation tanks or small ponds before discharge back into the main pond.

In the event that pH measurements of exposed soils in the excavation does not meet required levels, lime shall be spread over the affected area and the pH levels monitored.

Sufficient lime is to be stored in a dry location on site to permit the immediate implementation of the above contingency measures. Lime should be stored adjacent to the treatment ponds, excavations and fill areas.

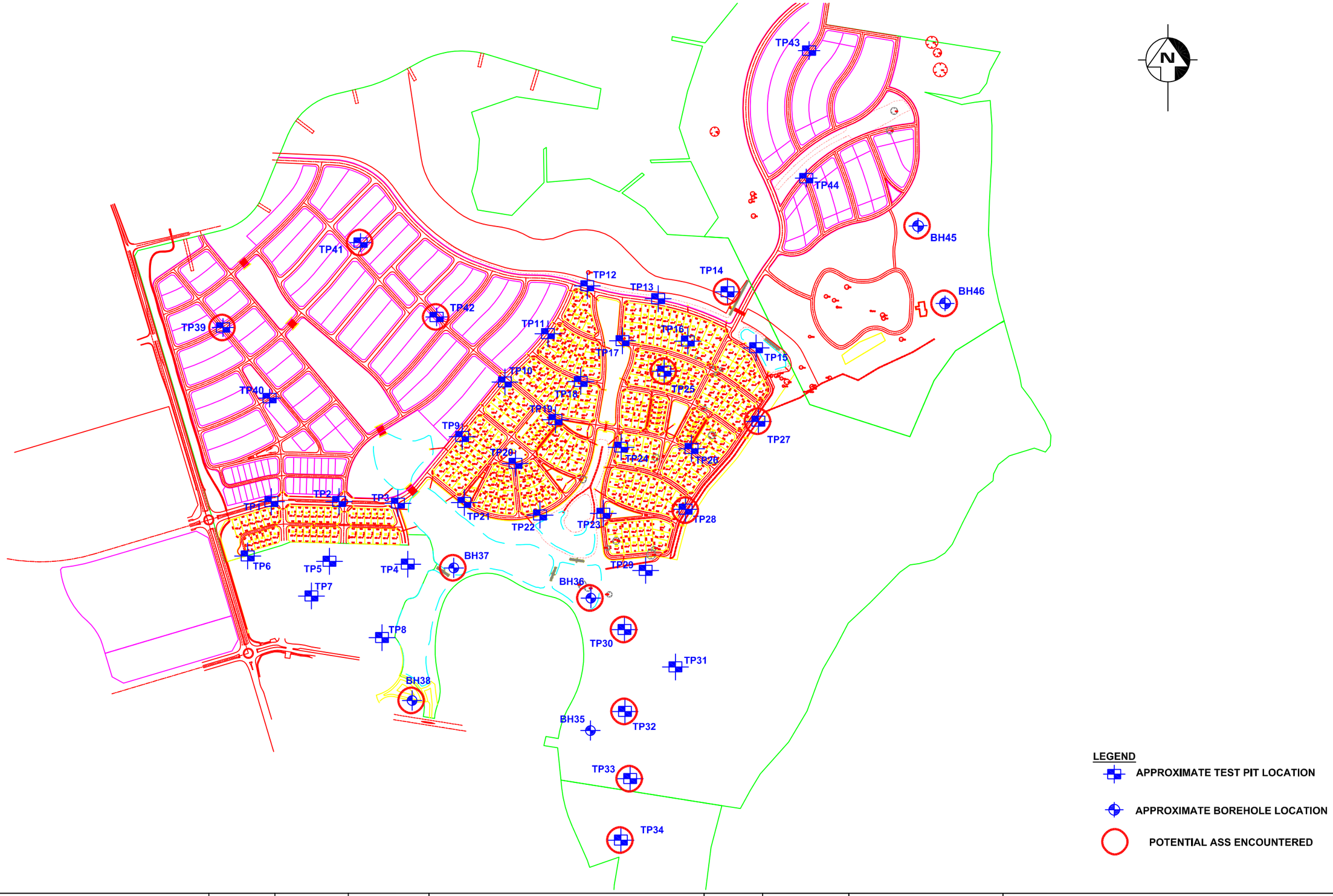
It is recommended that the works be carried out in the presence of a suitably qualified environmental consultant who can document the procedures carried out and assist with the monitoring and implementation of contingency measures during the works.

For and on behalf of Coffey Geotechnics Pty Ltd

Arthur Love

Principal Geotechnical Engineer

Figures



revision	description	drawn	approved	date

0 80 160 320 480

Scale (metres)

drawn	NLS
approved	ABL
date	05-04-11
scale	1:8000
original size	A3

coffey geotechnics
SPECIALISTS MANAGING THE EARTH

client: TATTERSALL SURVEYORS PTY LTD

project: PROPOSED SUBDIVISION
RIVERSIDE ESTATE PROJECT APPLICATION
AND CONCEPT PLAN AREA, TEA GARDENS

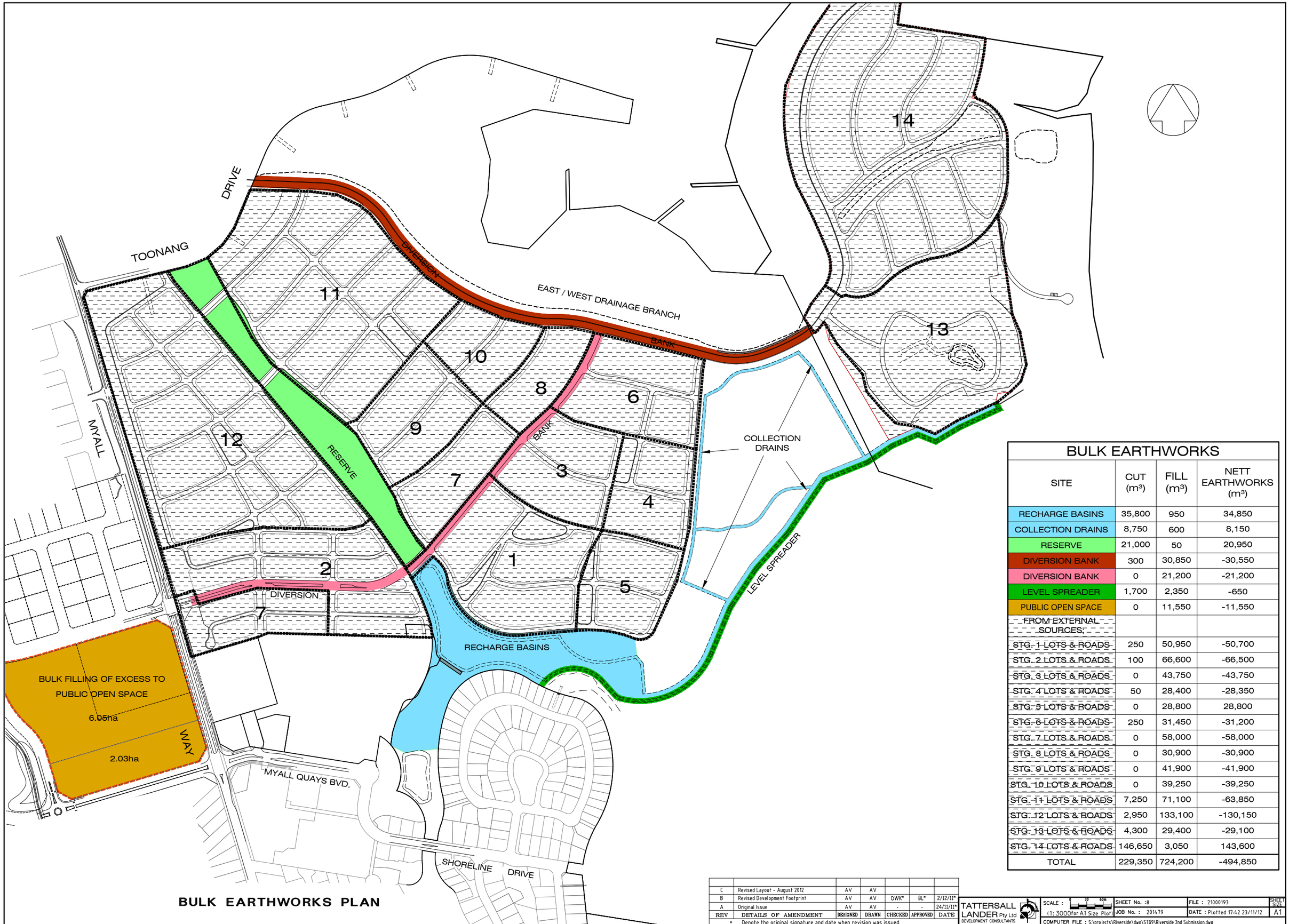
title: TESTPIT/BOREHOLE LOCATION PLAN

project no: GEOTWARA21006AB

figure no: 1 - Appendix C

Annex D

Bulk Earthworks Plan



BULK EARTHWORKS

SITE	CUT (m^3)	FILL (m^3)	NETT EARTHWORKS (m^3)
RECHARGE BASINS	35,800	950	34,850
COLLECTION DRAINS	8,750	600	8,150
RESERVE	21,000	50	20,950
DIVERSION BANK	300	30,850	-30,550
DIVERSION BANK	0	21,200	-21,200
LEVEL SPREADER	1,700	2,350	-650
PUBLIC OPEN SPACE	0	11,550	-11,550
~~FROM EXTERNAL SOURCES:~~			
~~STG. 1 LOTS & ROADS~~	250	50,950	-50,700
~~STG. 2 LOTS & ROADS~~	100	66,600	-66,500
~~STG. 3 LOTS & ROADS~~	0	43,750	-43,750
~~STG. 4 LOTS & ROADS~~	50	28,400	-28,350
~~STG. 5 LOTS & ROADS~~	0	28,800	28,800
~~STG. 6 LOTS & ROADS~~	250	31,450	-31,200
~~STG. 7 LOTS & ROADS~~	0	58,000	-58,000
~~STG. 8 LOTS & ROADS~~	0	30,900	-30,900
~~STG. 9 LOTS & ROADS~~	0	41,900	-41,900
~~STG. 10 LOTS & ROADS~~	0	39,250	-39,250
~~STG. 11 LOTS & ROADS~~	7,250	71,100	-63,850
~~STG. 12 LOTS & ROADS~~	2,950	133,100	-130,150
~~STG. 13 LOTS & ROADS~~	4,300	29,400	-29,100
~~STG. 14 LOTS & ROADS~~	146,650	3,050	143,600
TOTAL	229,350	724,200	-494,850

BULK EARTHWORKS PLAN

REV	DETAILS OF AMENDMENT	DESIGNED	DRAWN	CHECKED	APPROVED	DATE
C	Revised Layout - August 2012	AV	AV			
B	Revised Development Footprint	AV	AV	DWK*	BL*	2/12/11*
A	Original Issue	AV	AV	-	-	24/11/11*
*	Denote the original signature and date when revision was issued.					

TATTERSALL LANDER Pty Ltd DEVELOPMENT CONSULTANTS

SCALE : 0 30 60m (1: 3000for A1 Size Plot)
SHEET No. :8 | FILE : 21000193 | SHEET SIZE A1
JOB No. : 201479 | DATE : Plotted 17:42 23/11/12
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